MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

DCT5016 – CIRCUIT THEORY

(Diploma in Electronic Engineering)

5 OCTOBER 2022
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages excluding the cover page with 4 questions.
2. Answer **ALL** questions. All necessary working steps must be shown.
3. Please write all your answers in the answer booklet provided.

QUESTION 1 [25 MARKS]

For the circuit shown in Figure 1, calculate the following:

a) Total resistance.

[5 marks]

b) Current I_1, I_2 and I_3. Prove that Kirchhoff's Current Law (KCL) is satisfied.

[11 marks]

c) Current flowing through each resistor.

[3 marks]

d) Voltage across each resistor.

[6 marks]

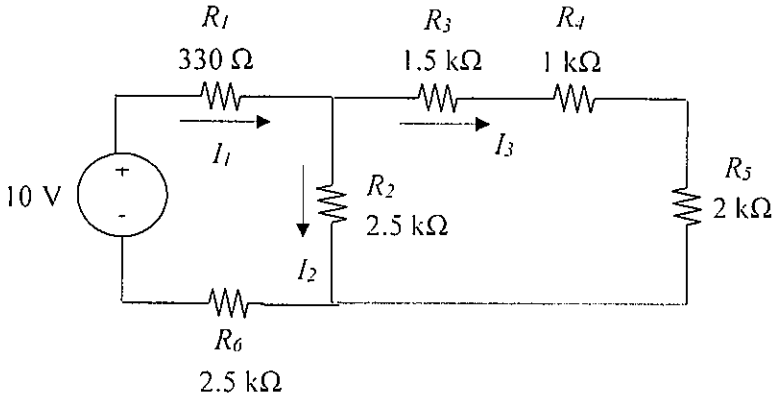

Figure 1

QUESTION 2 [25 MARKS]

a) For the circuit shown in Figure 2, calculate the Norton equivalent resistance (R_N) and Norton equivalent current (I_N) as seen by R_L.

[9 marks]

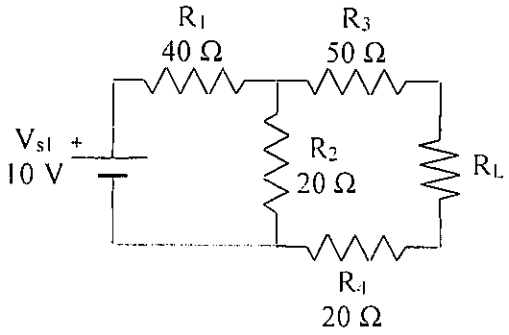

Figure 2

Continued...

b) For the circuit shown in Figure 3, using Mesh Current Analysis, calculate:

i) voltage drop at each resistor, V_{R1}, V_{R2}, and V_{R3}. [13 marks]

ii) power dissipated at resistor R_3 (P_{R3}). [3 marks]

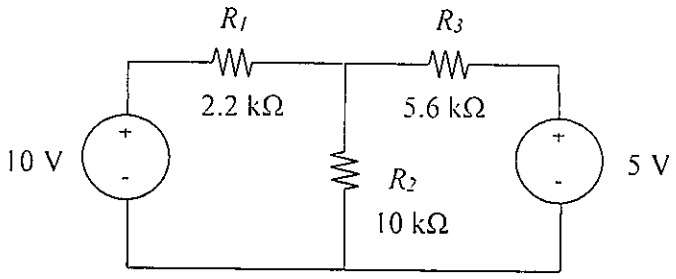

Figure 3

QUESTION 3 [25 MARKS]

By referring to the RLC circuit as shown in Figure 4:

a) Convert the circuit from time domain to frequency domain.

[6 marks]

b) Calculate the total impedance in the circuit. Also sketch the impedance phasor diagram.

[7 marks]

c) Calculate the steady state current $i(t)$, $i_1(t)$, *and* $i_2(t)$ in the circuit.

[12 marks]

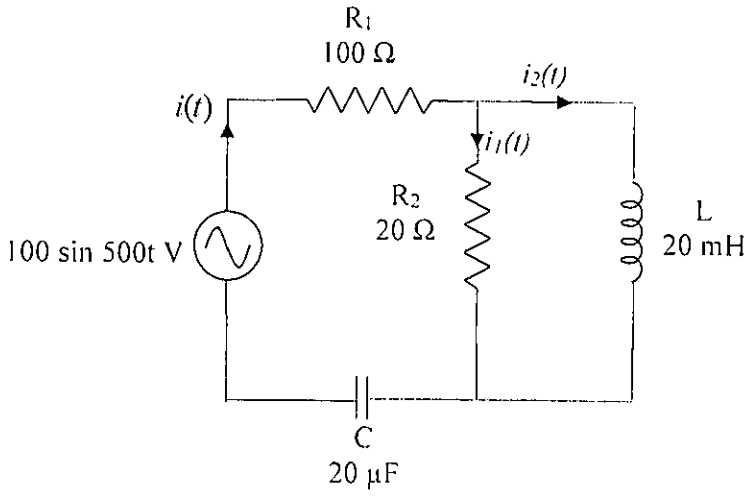

Figure 4

Continued...

QUESTION 4 [25 MARKS]

a) With the aid of diagrams, explain the principle of charging a capacitor.

[6 marks]

b) Define the following items:

i) transient condition [2 marks]
ii) steady-state condition [2 marks]

c) Figure 5 shows a capacitor is charging,

i) Calculate how long it takes for the capacitor to reach full charge.

[3 marks]

ii) Fill up Table 1 and draw the graph for voltage versus time constant.

[12 marks]

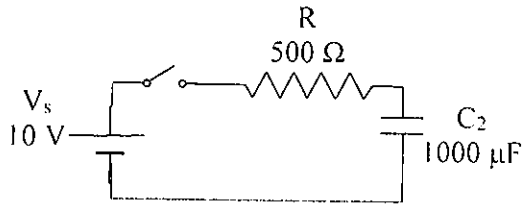

Figure 5

Time Constant	Percentage of voltage	Voltage across capacitor, V_c
0.5 time constant	39.30%	
1.0 time constant	63.20%	
2.0 time constants	86.50%	
3.0 time constants	95.00%	
5.0 time constants	99.30%	

Table 1

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